

地球物理学报 » 2013, Vol. 56 » Issue (1) :60-68 doi: 10.6038/cjg20130107

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引用本文(Citation):

王炳瑜, 陈凌, 艾印双, 何玉梅. 华北克拉通东北部及邻区地壳和地幔转换带厚度研究. 地球物理学报, 2013,56(1): 60-68,doi: 10.6038/cjg20130107

WANG Bing-Yu, CHEN Ling, AI Yin-Shuang, HE Yu-Mei. Crustal structure and mantle transition zone thickness beneath the northeastern area of North China Craton and adjacent region. Chinese Journal Geophysics, 2013, 56(1): 60-68, doi: 10.6038/cjg20130107

## 华北克拉通东北部及邻区地壳和地幔转换带厚度研究

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Crustal structure and mantle transition zone thickness beneath the northeastern area of the North China Craton and adjacent region

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摘要

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摘要

本文利用宽频流动台阵记录的远震波形数据和接收函数波动方程叠后偏移方法, 获得了华北克拉通东北部边界及其邻近地区的地壳和地幔转换带的间断面结构图像. 结果显示研究区域的地壳厚度存在显著的横向变化: 以南北重力梯度带为界, 西北部的兴蒙造山带地壳较厚 (~40 km), 东南部的燕山带、松辽盆地和辽东台隆地壳明显较薄 (30~35 km). 这有可能反映, 研究区南北重力梯度带两侧地壳在中-新生代区域构造伸展过程中经历了不同程度的改造和减薄. 地幔转换带成像结果显示, 研究区410 km和660 km间断面结构存在横向差异. 经度121° E-122° E之间, 上地幔底部出现双重间断面, 深度分别为660 km和690 km. 经度122.5° E以东(北黄海地区), 410 km间断面有5~20 km幅度的下沉, 660 km间断面有5~15 km幅度的抬升; 该地区地幔转换带厚度相对全球平均偏薄10~20 km, 指示着该地区较热的上地幔底部温度环境. 我们认为太平洋俯冲板块可能停滞在研究区119° E-122° E经度范围的地幔转换带中, 但未延伸至118° E以西; 而俯冲板块在124° E以东可能局部穿透了上地幔底部而进入下地幔, 同时引起小尺度的地幔对流, 导致北黄海地区下地幔物质的上涌.

关键词 华北克拉通东北部边界及其邻区, 接收函数, 地壳厚度, 410 km间断面, 660 km间断面

Abstract:

We apply a receiver function poststack migration method to teleseismic waveform data received by portable broadband stations, and obtain crustal and mantle transition zone structural image beneath the northeast boundary region of the North China Craton and adjacent areas. The result shows that the crustal thickness of our study region displays significant lateral variations. On the northwestern side of North-South Gravity lineament, the crust is thicker, averaging 38 km in Xingmeng orogenic belt, whereas in Yanshan belt, Songliao Basin and Liaodong anticline, which locate on the southwestern side of North-South Gravity lineament(NSGL), the thickness of crust is much thinner (30~35 km). This feature probably indicates that the crust of the opposite sides of the NSGL might have been destructed and thinned to different degrees during late Mesozoic to Cenozoic. The structural image of mantle transition zone reveals some topographic lateral variations of the 410 km and 660 km discontinuities. Between longitude 121° and 122°, there are double discontinuities at depths of 660 km and 690 km. East of longitude 122.5°, the 410 km discontinuity depresses 5~20 km, and the 660 km discontinuity uplifts 5~15 km, resulting in a 10~20 km thinner than global average mantle transition zone which reflects a warm lower uppermantle environment. We suggest that the Pacific subducted slabs were trapped in mantle transition zone between longitude 119° and 122° and didn't reach the west of longitude 118°; With the increasing of slab materials in mantle transition zone, part of the slab might have sunk into the lower mantle to the east of longitude 124°, which would cause a small-scale convection and generate hot upwelling.

Keywords [Northeastern boundary region of the North China Craton](#), [Receiver function](#), [Crustal thickness](#), [410 km discontinuity](#), [660 km discontinuity](#)

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